

Application No. 10/022,864
Response to Office Action

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Customer No. 01933

Listing of Claims:

1. (Currently Amended) A 3D image acquisition apparatus comprising:

a pattern projection section which projects a predetermined pattern on an object;

5 an imaging section which is ~~disposed~~ positioned at a predetermined distance from said pattern projection section and which images the object ~~on which~~ having the predetermined pattern ~~has been projected thereon~~; and

a depth calculation section which detects the projection
10 ~~projected~~ pattern projected on the object ~~based~~ on the basis of an image acquired by said imaging section, collates the detected ~~projection~~ ~~projected~~ pattern and the predetermined pattern projected by the pattern projection section, and calculates a depth of respective parts of the object ~~based~~ on the basis of the
15 ~~correspondency of the collation,~~

wherein the predetermined pattern ~~projected by said pattern projection section is formed by alternately arranging~~ includes local maximum areas with local maximum luminance values and local
minimum areas with local minimum luminance values, wherein a
20 total number of the local maximum luminance values and the local
minimum luminance values is at least three, and wherein the local
maximum areas are arranged alternately with the local minimum

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25 areas to encode the predetermined pattern based on the
arrangement of the local maximum areas and the local minimum
areas and the luminance values corresponding to the respective
local maximum areas and the respective local minimum areas.

2. (Currently Amended) A 3D image acquisition apparatus
comprising:

a pattern projection section which projects a predetermined
pattern on an object;

5 an imaging section which is ~~disposed~~ positioned at a
predetermined distance from said pattern projection section and
which images the object ~~on which~~ having the predetermined pattern
~~has been~~ projected thereon; and

10 a depth calculation section which detects an image pattern
~~based on the basis of~~ an image acquired by said imaging section,
collates the detected image pattern and the predetermined pattern
~~projected by the pattern projection section~~, and calculates a
depth of respective parts of the object based ~~on the basis of the~~
~~correspondency of~~ the collation,

15 wherein the predetermined pattern ~~projected by said pattern~~
~~projection section is formed by combining~~ includes patterns of a
plurality of color components, and the ~~patterns~~ pattern of each
of the plurality of color components ~~are formed by alternately~~
~~arranging~~ includes local maximum areas with local maximum

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20 luminance values and local minimum areas with local minimum
luminance values, wherein in the pattern of each of the plurality
of color components a total number of the local maximum luminance
values and the local minimum luminance values is at least three,
and wherein the local maximum areas are arranged alternately with
25 the local minimum areas to encode the pattern of each of the
plurality of color components based on the arrangement of the
local maximum areas and the local minimum areas and the luminance
values corresponding to the respective local maximum areas and
the respective local minimum areas.

3. (Currently Amended) A 3D image acquisition apparatus
according to claim 2, wherein in the patterns of each of the
plurality of color components, positions of the local maximum
areas with ~~local maximum luminance values~~ and positions of the
5 local minimum areas with ~~local minimum luminance values~~ are
aligned the same.

4. (Currently Amended) A 3D image acquisition apparatus
according to claim 2, wherein in the patterns two of the
plurality of color components, positions of the local maximum
areas with ~~local maximum luminance values~~ and positions of the
5 local minimum areas with ~~local minimum luminance values~~ are
shifted different.

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5 5. (Currently Amended) A 3D image acquisition apparatus according to claim 2, wherein ~~the position~~ positions of the area ~~with the local maximum luminance of areas in~~ the pattern of at least one of the plurality of color components ~~is aligned with the position are the same as positions~~ of the area ~~with the local minimum luminance of areas in~~ the patterns of the ~~other others of~~ the plurality of color components.

6. (Previously Presented) A 3D image acquisition apparatus according to claim 2, wherein said plurality of color components are RGB components.

7. (Currently Amended) A 3D image acquisition apparatus according to claim 1, wherein the ~~projected~~ predetermined pattern is one of a stripe pattern or and a matrix pattern.

8. (Currently Amended) A 3D image acquisition apparatus comprising:

5 a pattern projection section which projects ~~on an object~~ a spatial encoding pattern ~~in which blocks or areas with local maximum and minimum luminance values are alternately arranged and encoding is effected by combining local maximum/minimum information and gradation information~~ onto an object;

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a pattern memory which stores the spatial encoding pattern
~~that is projected by the pattern projection section;~~

10 a at least one light reception section which receives light
reflected by the object;

an at least one image memory which stores information of
corresponding to the light received by the light reception
section;

15 a depth calculation section which calculates depth
information of the object based on the ~~basis of the~~ pattern of
the image information stored in the image memory and the spatial
encoding pattern stored in the pattern memory;

20 a 2D image information generating section which generates 2D
image information based on the ~~basis of~~ the information stored in
the image memory; and

25 a 3D image generating section which generates a 3D image
based on the ~~basis of~~ the 2D image information generated by the
2D image information generating section and the depth information
calculated by the depth calculation section;

30 wherein the spatial encoding pattern includes local maximum
areas with local maximum luminance values and local minimum areas
with local minimum luminance values, wherein a total number of
the local maximum luminance values and the local minimum
luminance values is at least three, and wherein the local maximum
areas are arranged alternately with the local minimum areas to

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35 encode the predetermined pattern based on the arrangement of the
local maximum areas and the local minimum areas and the luminance
values corresponding to the respective local maximum areas and
the respective local minimum areas.

9. (Currently Amended) A 3D image acquisition apparatus
according to claim 8, wherein said ~~3D image acquisition apparatus~~
has at least one light reception section comprises a plurality of
~~said~~ light reception sections and said at least one image member
5 comprises a plurality of ~~said~~ image memories, and

wherein said 3D image acquisition apparatus further includes
comprises a correspondence determination section which matches
~~the contents of and collates the image information in the image~~
memories and ~~collates the images,~~

10 wherein the depth calculation section calculates ~~3D the~~
depth information of the object based on ~~the basis of information~~
~~determined by an output of the correspondence determination~~
section, and

wherein said 3D image section generates a 3D image based on
15 ~~the basis of information generated by the 2D image information~~
~~generating section and the value~~ depth information calculated by
the depth calculation section.

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10. (Currently Amended) A 3D image acquisition method
comprising:

~~a step of projecting a predetermined pattern on an object;~~

~~a step of imaging acquiring an image of the object on which~~

5 ~~having the predetermined pattern has been projected thereon, at a~~
~~position at that is a predetermined distance from a position~~
~~where the predetermined pattern has been projected of the object;~~
and

~~a step of detecting a the projected pattern based on the~~
10 ~~basis of an acquired image acquired by said imaging step of the~~
~~object; [[,]]~~

collating the detected pattern and the predetermined
pattern; ~~projected by said pattern projection step, and~~

15 calculating a depth of respective parts of the object based
~~on the basis of the correspondency of the collation; [[,]]~~

wherein the predetermined pattern ~~projected by said pattern~~
~~projection step is formed by alternately arranging includes local~~
maximum areas with local maximum luminance values and local
minimum areas with local minimum luminance values, wherein a
20 total number of the local maximum luminance values and the local
minimum luminance values is at least three, and wherein the local
maximum areas are arranged alternately with the local minimum
areas to encode the predetermined pattern based on the
arrangement of the local maximum areas and the local minimum

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25 areas and the luminance values corresponding to the respective
local maximum areas and the respective local minimum areas.

11. (Currently Amended) A 3D image acquisition method
comprising:

~~a step of projecting a predetermined pattern on an object;~~

~~a step of imaging acquiring an image of the object on which~~

5 having the predetermined pattern has been projected thereon, at a
position at that is a predetermined distance from a position
~~where the predetermined pattern has been projected of the object;~~
and

~~a step of detecting a the projected pattern based on the~~
10 ~~basis of an acquired image acquired by said imaging step of the~~
object; [[,]]

collating the detected pattern and the predetermined
pattern; ~~projected by said pattern projection step~~, and

calculating a depth of respective parts of the object based
15 ~~on the basis of the correspondency of the collation; [[,]]~~

wherein the predetermined pattern ~~projected by said pattern~~
~~projection step is formed by combining~~ includes patterns of a
plurality of color components, and the ~~patterns~~ pattern of each
of the plurality of color components ~~are formed by alternately~~
20 ~~arranging~~ includes local maximum areas with local maximum
luminance values and local minimum areas with local minimum

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luminance values, wherein in the pattern of each of the plurality
of color components a total number of the local maximum luminance
values and the local minimum luminance values is at least three,
25 and wherein the local maximum areas are arranged alternately with
the local minimum areas to encode the pattern of each of the
plurality of color components based on the arrangement of the
local maximum areas and the local minimum areas and the luminance
values corresponding to the respective local maximum areas and
30 the respective local minimum areas.

12. (Currently Amended) A method for encoding a spatial
pattern for 3D image acquisition method, to which applied is said
method comprising:

generating a spatial encoding pattern encoding method
5 wherein blocks or areas with including local maximum areas with
local maximum luminance values and local minimum areas with local
minimum luminance values, wherein a total number of the local
maximum luminance values and the local minimum luminance values
is at least three; and are alternately arranged and a
10 predetermined code pattern is generated by combining local
maximum/minimum information and gradation information

alternately arranging the local maximum areas with the local
minimum areas to encode the predetermined pattern based on the
arrangement of the local maximum areas and the local minimum

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- 15 areas and the luminance values corresponding to the respective local maximum areas and the respective local minimum areas.

13. (Currently Amended) A ~~3D image acquisition~~ method according to claim 12, wherein the ~~code~~ spatial encoding pattern ~~obtained by the spatial pattern encoding method is one of a stripe pattern or~~ and a matrix pattern.

14. (Currently Amended) A ~~3D image acquisition~~ method according to claim 12, wherein the ~~code~~ spatial encoding pattern ~~obtained by the spatial pattern encoding method is encoded in substantially independent wavelength bands such as R, G and B.~~

15. (Currently Amended) A ~~3D image acquisition~~ method according to claim 14, wherein ~~blocks or~~ the wavelength bands are R, G and B and the local maximum areas with local maximum luminance values and the local minimum luminance values areas of each of R, G and B are aligned.

16. (Currently Amended) A 3D image acquisition method according to claim 14, wherein ~~blocks or~~ the wavelength bands are R, G and B and the local maximum areas with local maximum

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~~luminance values~~ and the local minimum ~~luminance values~~ areas of
each of R, G and B are shifted.

17. (Previously Presented) A 3D image acquisition apparatus according to claim 3, wherein said plurality of color components are RGB components.

18. (Previously Presented) A 3D image acquisition apparatus according to claim 4, wherein said plurality of color components are RGB components.

19. (Currently Amended) A 3D image acquisition apparatus according to claim 2, wherein the ~~projected~~ predetermined pattern is one of a stripe pattern ~~or~~ and a matrix pattern.

20. (Currently Amended) A 3D image acquisition apparatus according to claim 3, wherein the ~~projected~~ predetermined pattern is one of a stripe pattern ~~or~~ and a matrix pattern.

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21. (Currently Amended) A 3D image acquisition apparatus according to claim 4, wherein the ~~projected~~ predetermined pattern is one of a stripe pattern ~~or~~ and a matrix pattern.